in Malaysia. **METHODS:** A non-parametric method called Data Envelopment Analysis (DEA) with two assumptions : Variable Return to Scale (VRS) and Constant Return to Scale (CRS), was used to calculate and compare the efficiency scores for selected hospitals' clinical departments between the year 1998 and 2006. DEA input oriented analysis indicates how the inefficient units could adjust their inputs to reach the efficiency frontier. **RESULTS:** Based on CRS model the mean efficiency scores in Hospital A departments were 76%. One department was around 50% and six departments were between 50% and 90% and three departments were more than 90%. The mean efficiency scores in Hospital B was 92%. In this hospital, two departments were between 75% and 90% and two departments had efficiency score equal 100% during study period. In Hospital C all departments were more than 75% and one department had efficiency score equals 100%. The results based on VRS model showed similar trends. **CONCLUSIONS:** The mean of efficiency score according different assumptions of Hospital B was higher than two other hospitals. The results showed that few departments are efficient and rests are considered inefficient and need to find optimum mixture of inputs combination. It is suggested that Hospital A and Hospital C should consider to improve their management of the resource inputs in inefficient department in order to enhance their efficiencies.

HEALTH CARE USE & POLICY STUDIES – Health Technology Assessment Programs

PHP37

PRIORITIZATION OF HEALTH POLICY AND SYSTEM RESEARCH TOPICS IN THAILAND: MAKING IT SYSTEMATIC, TRANSPARENT AND PARTICIPATORY

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OBJECTIVES: A growing concern is that health policy and system researches (HPSR) should address the needs of potential users, and subsequently have substantial impacts on policy decisions and professional practices. The purpose of this study is to describe the experience on the annual HPSR topic prioritization conducted by Thailand's Health Systems Research Institute and its alliances. **METHODS:** Narrative descriptive and quantitative approaches were employed to illustrate the processes of and results from the HPSR topic prioritization in 2010. **RESULTS:** The prioritization process was carried out on the basis of systematicness and transparency, with participation by key stakeholders including policymakers, academics, health professionals, civil society, and industries. There was a call for research topic proposals from stakeholders in November and December 2009. A total of 120 topics suggested by 66 organizations were then prioritized by 90 representatives of stakeholder organizations. Multiple criteria introduced in this step involved policy relevance; disease burden; economic impact; social and ethical aspects; variation in practices; possibility of changing practices; and public concerns. It was found that topics related to diseases with high burden, relating to service delivery especially on health promotion and disease prevention, and those submitted by central government agencies were more likely to get high priority than others. In addition, results from self-administrative survey demonstrated that over 92% of stakeholders strongly supported and expressed their interest to participate in the next annual topic prioritization process. **CONCLUSIONS:** This case study demonstrated that it is feasible to develop clear criteria and transparent process for prioritization of HPSR topics. Lessons learned from this case study can be useful for improving mechanism for selecting HPSR topics in other settings.

PHP38

COMPLEXITY INCREASES UNCERTAINTY: THE IMPACT OF PBAC GUIDELINES (VERSION 4) ON PBAC DECISION-MAKING

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OBJECTIVES: In Australia, the Pharmaceutical Benefits Advisory Committee (PBAC) makes recommendations to the Minister for Health on the reimbursement of pharmaceuticals. The sponsor's submission is accepted by the PBAC if the drug is determined to be clinically effective and also cost-effective. New PBAC Guidelines on how to prepare a submission (version 4) were introduced in 2008. These new Guidelines sought to reduce the uncertainty for the PBAC in accepting the many inferences made in major submissions. We assessed whether the New Guidelines have indeed reduced the PBAC's uncertainty in their decision-making. **METHODS:** Since June 2003 all PBAC recommendations have been made public on the Department of Health & Ageing website. Public Summary Documents (PSD) are available for PBAC considerations relating to the PBS listing of medicines since July 2005 meeting. We reviewed all the PSDs reported during the period of July 2005 to July 2009. For each PSD, we estimated the average number of times that the words "uncertain/uncertainties/uncertainty" appear per PSD page. We compared the results for the period before and after the introduction of version 4 of the PBAC Guidelines. **RESULTS:** The average number of times that the words "uncertain/uncertainties/uncertainty" appeared per PSD page was significantly higher for the period after the introduction of version 4 of the PBAC Guidelines compared to the period before (0.51 vs. 0.66, $P < 0.00001$). **CONCLUSIONS:** The introduction of version 4 of the PBAC Guidelines in 2008 has led to an increase in the complexity and, thus, uncertainty faced by PBAC during their deliberations around reimbursement of pharmaceuticals in Australia. There was a significant 30% increase in the number of times that the word "uncertain/uncertainties/uncertainty" was found per PSD page compared with the period prior to the introduction of the version 4 of the Guidelines (2003–2008).

HEALTH CARE USE & POLICY STUDIES – Prescribing Behavior & Treatment Guidelines

PHP39

THE EFFECTS OF DIRECT BILLING SYSTEM IN PATIENTS WITH CIVIL-SERVANT MEDICAL BENEFIT SCHEMES ON PRESCRIBING PATTERNS

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OBJECTIVES: In 2006, the reimbursement system for civil-servant medical benefit schemes beneficiaries in Thailand was changed to direct billing system. It was unknown how this new system affects drug expenditures and the number of drug supply given to beneficiaries. This study aims to assess the effects of direct billing system on prescribing patterns. **METHODS:** This study was undertaken with retrospective cohort approach. We used the data recorded in databases of a university hospital in northern part of Thailand. We undertook the data on all patients with civil-servant medical benefit schemes who came to out-patients department between October 1, 2005 and March 31, 2007. Mean cost of medication, number of days' supplies and medication possession ratio (MPR) of five highest costs of oral medication were calculated in 1 year before and after the system was changed. **RESULTS:** Out of 43,897 visits made at the hospital, 15,632 (36%) were under civil-servant medical benefit schemes. Eighty-eight percent (13,785/15,632) received medications during visit. The total costs of medication increased from 2 million to 4 million baths in 1 year. Glucosamine, atorvastatin, rosiglitazone, clopidogrel and diacerin were highest used in terms of drug cost. Averages of day's supplies based on these medications increased from 1.29 to 1.48 months per a prescription. Proportion of patients receiving medications more than 3 months, was slightly increased from 1.82% to 2.43%. Three out of five medications had higher MPR after system was changed (Relative risk ranged on 1.19–2.32). Two of these were statistical significant. **CONCLUSIONS:** The direct billing system affects prescribing patterns as indicated by trend of increased number of day's supplies and higher medication possession ratio. Further evidence remains needed. Policymakers need to consider all relevant and important consequences associated with the new system prior to making policy decision-making.

INDIVIDUAL'S HEALTH – Clinical Outcomes Studies

PIH1

CRITICAL APPRAISAL OF SYSTEMATIC REVIEWS ASSESSING SAFETY OUTCOMES OF SSRIS IN THE PERINATAL PERIOD

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OBJECTIVES: A systematic appraisal was conducted of published systematic reviews that assessed the harms associated with selective serotonergic reuptake inhibitors (SSRIs) in the perinatal period, both for the mother and infant. **METHODS:** A systematic method of literature searching and selection was employed for this review. Searches were conducted in EMBASE, Medline and the Cochrane Database of Systematic Reviews. Studies were eligible if they evaluated pregnancy or infant-related safety outcomes for SSRI use in pregnant or lactating women. **RESULTS:** The literature search identified seventeen systematic reviews and three subsequently published prospective cohort studies. None of the systematic reviews assessing serotonergic antidepressants as a group found an association with congenital malformations. An association between paroxetine exposure and infant cardiovascular malformations has been reported in the literature; however, more recent evidence from a large systematic review shows no relationship between paroxetine exposure and congenital cardiac malformations. Neonatal symptoms (such as withdrawal symptoms, lower Apgar score, and diminished response to pain stimulus) have been reported in 20–30% of infants with third trimester SSRI exposure. All of the reviews reported the symptoms as mild and self-limiting. Several SRs found a significant association between SSRI use in pregnancy and premature delivery, low birthweight, and admission to special care nurseries. There is conflicting evidence regarding the long-term neurodevelopmental risks of serotonergic antidepressants. Although the levels of SSRIs in breast milk are relatively low, the evidence for the safety of antidepressant exposure via breastfeeding is limited. **CONCLUSIONS:** SSRI exposure during pregnancy is associated with mostly minor and temporary adverse outcomes for the newborn. The risk of these outcomes needs to be balanced with the risk of adverse outcomes resulting from SSRI withdrawal for the mother.

PIH2

IMPACT OF HPV VACCINATION ON CERVICAL CANCER IN ASIA: RESULTS OF A STATIC MODEL

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OBJECTIVES: Estimate the potential clinical effect of HPV vaccination with a bivalent HPV-16/18 vaccine in Asian countries including the effect of cross-protection against non-vaccine oncogenic HPV types. **METHODS:** A static population model estimates

the expected annual number of cervical cancer cases (CC) and deaths prevented by HPV vaccination of 12-year-old girls in Asian countries (WHO classes) at steady state. Input data are, for each country, the incident CC cases and deaths (GLOBOCAN 2002), the distribution of HPV types in CC (http://www.who.int/hpvcentre) and the clinical trial vaccine efficacy against CIN2+ related to HPV-16/18 and HPV-31,45,33,52,58,35, 39,51,56,59 combined (cross-protection). Lifetime vaccine protection is assumed. The effect of vaccination coverage and the use of alternative estimates for countries without sufficient data are explored. **RESULTS:** Of 47 countries, sufficient country-specific input data are available for eight (China, Japan, Iran, Indonesia, Republic of Korea, Thailand and Philippines). The model predicts that, with 100% vaccine coverage, the HPV-16/18 CC and death reduction ranges from 57% (Japan: –4421 cases; –2032 deaths) to 74% (Thailand: –4627 cases; –1942 deaths) while cross-protection related CC and death reduction ranges from 9% (Iran; –102 cases, –53 deaths) to 27% (Japan; –2073 cases; –953 deaths). The overall reduction ranged from 78% (Iran: –873 cases, –454 deaths) to 89% (Indonesia: –13,375 cases; –6724 deaths; Thailand –5534 cases; –2323 deaths). With 70% vaccine coverage the CC cases prevented ranges from 611 to 80,052 and CC deaths prevented from 318 to 44,921 for Iran and India respectively. Eastern, south-eastern, southern Asia and Asia continent distributions are available and can be used as a proxy for countries without sufficient HPV data. **CONCLUSIONS:** Modeling predicts HPV vaccination with a bivalent HPV-16/18 vaccine could result in substantial reductions in CC cases and deaths in Asian countries. Cross-protection could play an important role in this reduction.

INDIVIDUAL'S HEALTH – Cost Studies

PIH3

A COSTING STUDY COMPARING MIDWIFERY GROUP PRACTICE WITH USUAL CARE IN AN AUSTRALIAN METROPOLITAN HOSPITAL

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OBJECTIVES: To undertake an economic evaluation of the costs and outcomes of midwifery group practice care compared with usual care in an Australian metropolitan hospital. **METHODS:** In a cohort study, pregnant women at low risk of complications could select to receive midwifery group practice care or usual care early in their pregnancy and were recruited when they were 35 weeks pregnant. Midwifery group practice provides care by the same two to three midwives and labor in a birth center. Usual care consists of women generally attending a GP or midwives antenatal clinic for antenatal care, followed by labor in the hospital. Costing data was collected from week 36 of pregnancy until 6 weeks postpartum. Costing for antenatal, labor, baby, and postnatal care were collected using the hospital accounting system. Women kept a diary with the number of antenatal and postnatal visits. Costing data on GP visits were calculated using the diaries and government reimbursement costs. **RESULTS:** The study included 102 women, with 52 women receiving midwifery group practice care and 50 women receiving usual care. Midwifery group practice care was associated with fewer antenatal visits, lower rate of induction and pharmacological pain relief, shorter stay in hospital and more postnatal visits. There were no statistical differences in clinical outcomes of the baby. The cost of antenatal care was similar between the groups; labor and baby costs were lower for midwifery group practice, while postnatal costs were higher in the midwifery group practice. Midwifery group practice was associated with a lower total cost per woman compared to usual care (A$4447 vs. A$5772, $P = 0.047$). **CONCLUSIONS:** For women at low risk of complications midwifery group practice is a cost-effective option, with better clinical outcomes and lower total costs.

PIH4

COST OF PUBLIC HEALTH DELIVERY OF CHILDHOOD IMMUNIZATIONS IN NOVA SCOTIA

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OBJECTIVES: Childhood immunizations are recognized as one of the most cost-effective health interventions. Yet little is know about the actual delivery costs, or variation in costs by service providers and geographic regions. This study undertook an economic analysis of public health delivery of childhood immunizations in Nova Scotia. **METHODS:** The analysis was performed from the perspective of the government health-care provider for a 1-year period from April 2005 to March 2006. An incremental approach was used to assess the cost of delivering childhood immunizations in addition to existing services. Primary cost data collected included capital and recurrent costs. Total provider economic costs were estimated using a combination of ingredients-based costing and step-down cost allocation methodologies. Sensitivity analysis was used to examine the influence of data uncertainty on cost results. Multivariate econometric analysis was used to estimate cost functions. **RESULTS:** Data was collected from four District Health Authorities in Nova Scotia, representing the delivery of 2951 immunizations. Average cost per immunization ranged from $51 to $105 when delivered in main public health offices and $45 to $150 when delivered in off-site clinics. The main cost driver was personnel costs. Econometric analysis showed a link between average cost and volume of service delivery. **CONCLUSIONS:** The cost of public health delivery of childhood vaccines varies according to the volume of services delivered and the delivery setting. The approach developed can be applied to the introduction of new vaccines such as human papilloma virus. Public health delivery of vaccines can be efficient if programmed on the appropriate scale.

PIH5

MEDICAL COST AND UTILIZATION FOR PATIENTS WITH POSTPARTUM HEMORRHAGE IN KOREA

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OBJECTIVES: To investigate medical cost and health resource utilization for patients with postpartum hemorrhage (PPH) in Korea in 2008. **METHODS:** This population-based study utilized the claims data of the Korea Health Insurance Review Agency from January 2008 to December 2008. Patients with PPH were identified based on ICD-10 code (O72, O721, O722, O723) that occurred within 6 weeks after normal or cesarean delivery. Treatments for PPH were classified into four categories: uterine contraction drugs only, drugs and transfusion, drugs + transfusion + uterine artery embolization (UAE), and drugs + transfusion + hysterectomy. Medical costs for PPH patients included all costs incurred for delivery and treating PPH. Costs and length of stay were analyzed in regard to the mode of delivery, age, and type of hospital where the delivery took place. Data were analyzed using SAS. **RESULTS:** There were 18,142 (4%) PPH patients out of 452,219 deliveries in Korea in 2008. The medical cost (mean ± SD) in patients who underwent normal delivery (ND) without PPH was 610 ± 153 US$ and 758 ± 859 US$ for patients with PPH. The medical cost in patients who underwent cesarean delivery (CD) without PPH was 973 ± 1403 US$ and 860 ± 511 US$ for patients with PPH. Length of stays (mean ± SD) were 3.7 ± 1.8 days, 3.3 ± 0.7 days, 7.7 ± 8.8 days and 7.1 ± 3.2 days for ND with PPH patients, ND without PPH patients, CD with PPH patients, and CD without PPH patients, respectively. The mean medical cost of patients who were treated with drugs only, drugs and transfusion, drugs + transfusion + UAE, and drugs + transfusion + hysterectomy were US$628, US$1028, US$3850, and US$3501, respectively. **CONCLUSIONS:** The medical cost was higher in patients with PPH compared to patients without PPH. Although the medical cost of treating PPH with UAE is higher than that of hysterectomy, preserving fertility seems well worth the additional cost.

PIH6

BUDGET IMPACT ANALYSIS OF INCLUDING LIVER TRANSPLANTATION IN CHILDREN INTO THE UNIVERSAL COVERAGE BENEFIT PACKAGE OF THAILAND

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BACKGROUND: Liver transplantation in children is an expensive health service excluded from the benefit package of the universal coverage (UC) scheme, which covers 47 million of Thais. Its high costs and exclusion from the UC benefit package prevent poor biliary atresia (BA) patients from access to such health care. **OBJECTIVES:** This study aims to estimate financial impact of including liver transplantation in children in the UC benefit package. It also explores demand for, and supply of, and financial feasibility in implementing universal access to such expensive health care in Thailand. **METHODS:** Methods include comprehensive literature review, in-depth interviews of medical specialists in liver transplantation in three university hospitals about incurred costs during and after operations, and modeling budget requirements for expanding universal access to such medical care. **RESULTS:** Research findings indicate that the incidence of BA patients in Thailand is approximately 1 to 15,000 of live births, approximately 60 new cases of BA patient annually. Only three university hospitals in Thailand can provide liver transplantation to children with the annual maximum surgical capacity of 40 cases. Literature shows the survival rate of BA children receiving liver transplantation ranges from 83% to 94% in the first year, and 82% to 92% in the fifth year. Costs of liver transplantation in the first year are approximately 1 million Baht (US$30,000). Other costs after the first year including immunosuppressive drugs and prophylaxis antibiotics range from US$360–600 per month. The government will spend approximately 40 million Baht in the first year of implementation. The financial burden will increase to 184 and 328 million Baht per year in the year 30th and 70th, respectively. **CONCLUSIONS:** The budget requirement for this medical care is trivial compared to the total UC budget, but can save lives of BA patients and improve equity in access to health care.

PIH7

ECONOMIC EVALUATION OF HUMAN PAPILLOMAVIRUS (HPV) VACCINATIONS IN THE PREVENTION OF CERVICAL CANCER

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OBJECTIVES: Cervical cancers are the second highest incidence of female cancers in Malaysia, causing high impact on nation's health cost and patient's quality of life that can be avoided by better screening and HPV vaccination. **METHODS:** This is a cross sectional study done from 2006–2009 and respondents were interviewed from six public hospitals. Methods include experts' panel discussions to estimate treatment costs and respondents' interviews using costing and SF-36 quality of life (QOL) questionnaires. Three programs options were compared i.e., Pap smear screening; quadrivalent HPV vaccination and combined strategy (screening plus vaccination). **RESULTS:** Five hundred two cervical cancer patients participated in the study. Mean